VI Semester Syllabi – Electrical Engineering

Sr. No.	Course Code	Course Name	L	T	P	Credits
1.	EE3CO10	Switchgear & Protection	3	0	0	3
2.	EE3CO12	Power System-II	3	1	2	5
3.	EE3CO14	Electric Drives	3	0	0	3
4.	EE3EXXX	Program Elective-III	3	0	0	3
5.	EE3EXXX	Program Elective-IV	3	0	0	3
6.	OEXXXXX	Open Elective-II	3	0	0	3
7.	EN3MC04	Technical English	2	0	0	0
8.	EE3CO18	Modelling and Simulation lab – I	0	0	4	2
9.	EE3CO19	Advance Electrical Engineering	0	0	2	1
		Total	**20**	**1**	**8**	**23**
		Total Contact Hours	29			

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EE3CO10	Switchgear and Protection	3	0	0	3

UNIT-I

Fault Analysis- Per unit system representation and its advantages, faults in power systems (Symmetrical& Unsymmetrical), single line and equivalent impendence diagram representation of powersystem components. Symmetrical components and its application to power systems, faultanalysis, Sequence networks and their interconnection for different types of faults, effect of faultimpedance, current limiting reactors, location and application, short circuit capacity.

UNIT-II

Protective Relays- Requirement of relays, primary & backup protection, desirable qualities of relays, concept ofpickup, reset & drop-off, drop off/ pickup ratio, inverse time & definite time characteristics, attractedarmature, balanced beam, induction disc, induction cup, moving coil & moving iron, rectifier ,thermal, bimetal directional relay, frequency, dc, all or nothing relays. Over current, over voltage, directional, differential and distance relays, R-X diagram, impedance, mho & reactance relay. Introduction to static & digital relays, classification ofstatic relays.

UNIT-III

Circuit Breakers- principles of arc quenching, recovery & re-striking voltage, current chopping, factor affecting re-striking voltage, capacitive current braking, kilometric faults, ratings of CB, resistance switching, types of CB,description and operation of bulk oil, minimum oil, air break, air blast, SF6, vacuum circuitbreakers and DC circuit breaking, their comparative merits, HRC fuses, testing of circuitbreaker.

UNIT-IV

Protection of Generators and Transformers- Types of abnormalities on alternator, stator and rotor protection, negative sequence protection, loss of excitation and overload protection. Types of fault on transformers, percentage differential protection, buchholz relays. Induction motor protection- introduction to various faults and abnormal operating conditions, unbalance supply voltage and single phasing, introduction to protection of induction motors, percentage differential, earth fault and negative sequence voltage relays

UNIT-V

Switching surges: phenomena of lightning, over voltage due to lightning, protection againstlightning, lightning arrestors, selection of lightning arrestors, surge absorbers and diverters, rodgap, horn gap expulsion type & valve type lightning arrestors, solid resistance and reactanceearthing, arc suppression coil, earthing transformers, earth wires, earthing of appliances,insulation co-ordination, definitions determination of line insulation, insulation level of substationequipment, co-ordination amongst items of substation equipment.

Text-Books

1 B. Ravindran and M Chander, Power System protection and Switchgear, New Age International.
2 Badrinath and Vishwakarma, Power System protection and switchgear, TMH.
3 CL Wadhwa, Electrical Power systems, New age International.

Reference Books

1 Haddi Saadet, Power System Analysis, TMH
2 Sunil S. Rao, Switchgear & protection. Khanna Publication.
3 Ravindra P. Singh, Switchgear & Power System Protection, PHI Learning

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EE3CO12	Power Systems-II	3	1	2	5

UNIT-I

Introduction and Modeling- Advantages and problems in interconnected and deregulated power systems, distributed generation, formation of bus admittance and impedance matrix, modeling of regulating transformer.

UNIT-II

Load Flow Analysis & Economic dispatch-Bus classification, load flow equations, Gauss Seidel, Newton-Raphson and FDLF methods for the solution of the load flow equations. Economic dispatch, system constraints, economic dispatch neglecting losses, economic dispatch including losses, automatic load dispatching.

UNIT-III

Load Frequency control- Load frequency problem, speed governing systems, model of speed governing systems, turbine model, generator-load model, limits on frequency variation, frequency control in parallel operation of two alternators, two area load frequency control.

UNIT-IV

Voltage control –Reactive power & voltage control, production & absorption of reactive power, methods of voltage control, static VAR systems, excitation systems, general block diagram representation of voltageregulators.

UNIT-V

Power System Stability –Steady-state, dynamic and transient stability, swing equation of a synchronous machine connected to an infinite bus, power angle curve, description of the phenomena of loss of synchronism in a single-machine infinite bus system following a disturbance like a three phase fault, solution of swing equations using step by step methods, equal area criterion, methods of improvingstability.

Text Books

1. A. R. Bergen and V. Vittal, "Power System Analysis", Pearson EducationInc.
2. C. L. Wadhwa, Electrical Power systems, New ageInternational.
3. D. P. Kothari and I. J. Nagrath, Modern Power System Analysis, McGraw HillEducation.

References Books

1. O. I. Elgerd, "Electric Energy Systems Theory", McGraw HillEducation.
2. P. Kundur, Power system stability and control, McGraw HillInc.
3. J. Grainger and W. D. Stevenson, "Power System Analysis", McGraw HillEducation.

List of Practicals:

1. To develop a program for formation of Y-bus matrix for N bussystem.
2. Load flow solution for 3-bus system using Gauss-Seidelmethod.
3. Load flow solution for 3-bus system using Newton Raphsonmethod.
4. Load flow solution for 3-bus system using FDLF method.
5. Load flow solution for IEEE 6-bus system using Newton Raphsonmethod.
6. Model determination of OLTC.
7. Determination of transient stability limit of synchronous machine connected to infinite bus using equal area criteria, using graphical approach.
8. Assessment of transient stability of a single machinesystem.
9. Effect of compensation on voltage profile.
10. Solution of economic dispatch problem.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EE3CO14	Electric Drives	3	0	0	3

UNIT-I

Electrical Drives-Elements of drive systems, requirement of electric drives, advantages of electrical drives, rating & selection of drives, groups and individual drives, constant power and constant torque drives.

Motor mechanism dynamics –fundamental torque equations, speed torque conventions and multi-quadrant operation, criteria for steady state stability of an electric drives.

UNIT-II

Control of D.C. motors by converters- Introduction to thyristor controlled drives, single phase semi and fully controlled converters and three phase semi and fully controlled converters connected to D.C. separately excited and D.C. series motors-continuous current operation, output voltage and current waveforms, speed and torque expression, speed-torque characteristics, problems on converter fed D.C. motors.

UNIT - III

Chopper fed drives- Introduction to four quadrant operation, motoring operations, starting, braking: regenerative braking, dynamic braking and plugging, four quadrant operation of D.C. motor by dual converters-closed loop operation of dc motor (block diagram only) control of D.C. motors by choppers:-single quadrant, two-quadrant and four quadrant chopper fed D.C. separately excited and series excited motors, continuous current operation, output voltage and current waveforms-speed torques expressions-speed torque characteristics, problems on ;chopper fed D.C. motors, closed loop operation (block diagram only)

UNIT-IV

Control of Induction Motors on stator side-Control of induction motor by ac voltage controllers- waveforms, speed torque characteristics, variable frequency control of induction motor by voltage source, current source inverters and cycloconverters, PWM control comparison of VSI & CSI operations, speed- torque characteristics, numerical problems on induction motor drives, closed loop operation of induction motor drives.

Control of induction motors from rotor side-static rotor resistance control, slip power recovery static Scherbius drive, static Kramer drive, their performance and speed torque characteristics advantages- application-problems.

UNIT-V

Control of Synchronous Motors-Separate control & self control of synchronous motors, operation of self controlled synchronous motors by VSI, CSI and cycloconverters. Load commutated CSI fed synchronous motor, operation, waveform, speed torque characteristics, application, advantage, numerical problems, closed loop operation on synchronous motors drives.

Text-Books

1. G.K. Dubey, Fundamentals of Electrical Drives, Narosa Publications
2. V. Subramanyam, Thyristor control of Electric Drive, Tata Mc Graw Hill Pub
3. S.B. Dewan, G.R. Slemon, A. Straughen, Power semiconductor Controlled Drives, Wiley-Interscience

Reference Books

1. B.K. Bose, Power Electronic control of AC Drives. PHI Learning.
2. Ned Mohan, Electrical Drive, Wiley India
3. N.K. DW , P.K. Sen, Electric Drives, PHI

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EE3CO18	Modelling and Simulation lab - I	0	0	4	2

List of Experiments based on MATLAB/SCILAB

1. Determine node voltages and branch currents in a resistive network.
2. Obtain Thevenins equivalent circuit of a resistive network.
3. Obtain transient response of a series R-L-C circuit for step voltage and current input and for alternating square voltage waveform.
4. Obtain frequency response of a series R-L-C circuit for sinusoidal voltage input.
5. Determine line and load currents in a three phase delta circuit connected to a 3-phase balanced ac supply.
6. Determine Z,Y,H and transmission parameters of a two part network.
7. Obtain transient response of output voltage in a single phase half wave rectifier circuit using capacitance filter.
8. Draw and obtain output wave form of pulse generator.
9. Draw and obtain output wave form of single phase AC-DC converter with R, R-L load.
10. Draw and obtain output wave form of three phase AC-DC converter with R, R-L load.
11. Draw and obtain output wave form of DC-AC converter with R, R-L load.
12. Draw and obtain output wave form of three phase AC-AC converter with R, R-L load.
13. Verify truth tables of NOT, AND or OR gates implemented by NAND gates by plotting their digital input and output signals.
14. Fault analysis (L-L, L-G, LLG etc) using MATLAB/SCILAB.
15. Formation of Z bus using building algorithm using MATLAB/SCILAB.
16. Load flow analysis using MATLAB/SCILAB.

Text Books

1. Rudra Pratap, Getting Started with MATLAB - A Quick introduction for Scientists & Engineers, Oxford Univ. Press.
2. S. Jain, Modelling And Simulation Using Matlab-Simulink, Willey India
3. Tejas B. Sheth, Scilab: A Practical Introduction to Programming and Problem Solving, Create Space Independent Publishing Platform

Reference Books

1. William Palm III , Introduction to MATLAB 7 for Engineers, McGraw-Hill.
2. Raj Kumar Bansal, Ashok Kumar Goel, Manoj Sharma, MATLAB and its Applications in Engineering, Pearson Education.
3. Sandeep Nagar, Introduction to Scilab For Engineers and Scientists, Apress.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EE3CO19	Advance Electrical Engineering Laboratory	0	0	2	1

Prerequisite/Co-requisite:EE3CO10, EE3CO14

List of Practicals:

1 Determination of drop out factor of an instantaneous over current relay.
2 Determination of operating characteristic of IDMT relay.
3 Determination of operating characteristic of differential relay.
4 Determination of transmission line parameters using MATLAB tool.
5 Analysis of power system faults (Symmetrical & Asymmetrical) using MATLAB tool.
6 To obtain the waveform for single phase semi controlled rectifier fed DC Motor.
7 To obtain the waveform for three phases fully controlled rectifier fed DC Motor.
8 Speed control of DC motor using chopper.
9 V/f Control of induction motor in closed loop operation with variable load condition.
10 To obtain the waveform, characteristics of Synchronous motor using VSI.
11 Three phase induction motor speed control using slip power recovery scheme.
12 Speed control of three phase IM using closed loop.
13 Design and modelling of 1KW PV generator.
14 Design and modelling of PV generator with MPPT system.

Text Books

1. Rudra Pratap, Getting Started with MATLAB - A Quick introduction for Scientists & Engineers, Oxford Univ. Press.
2. S. Jain, Modelling And Simulation Using Matlab-Simulink, Willey India
3. Tejas B. Sheth, Scilab: A Practical Introduction to Programming and Problem Solving, Create Space Independent Publishing Platform

Reference Books

1. William Palm III , Introduction to MATLAB 7 for Engineers, McGraw-Hill.
2. Raj Kumar Bansal, Ashok Kumar Goel, Manoj Sharma, MATLAB and its Applications in Engineering, Pearson Education.
3. Sandeep Nagar, Introduction to Scilab For Engineers and Scientists, Apress.

Elective Subjects:

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EE3EL09	Utilization of Electrical Energy	3	0	0	3

UNIT-I

Illumination Engineering Nature of light, units, sensitivity of the eye, luminous efficiency, glare. Production of light; incandescent lamps, arc lamps gas discharge lamps-fluorescent lampspolar curves, effect of voltage variation on efficiency and life of lamps, distribution and control of light, lighting calculations, solid angle, inverse square and cosine laws, methods of calculations, factory lighting, flood lighting and street lighting, direct diffused and mixed reflection & transmission factor, refractors, light fittings.

UNIT-II

Heating, Welding And Electrolysis Electrical heating-advantages, methods and applications, resistance heating, design of heating elements, efficiency and losses control. Induction heating: core type furnaces, core less furnaces and high frequency eddy current heating, dielectric heating: principle and special applications, arc furnaces: direct arc furnaces, Indirect arc furnaces, electrodes, design of heating elements, power supply and control. Different methods of electrical welding, resistance welding, arc welding, energy storage welding, laser welding, electro beam welding, and electrical equipment for them. Arc furnaces transformer and welding transformers. Review of electrolytic principles, laws of electrolysis, electroplating, anodizingelectro-cleaning, extraction of refinery metals, power supply for electrolytic process, current and energy efficiency.

UNIT-III

Traction-Special features of traction motors, selection of traction motor, different system of electric traction and their advantages and disadvantages, mechanics of train movement: simplified speed time curves for different services, average and schedule speed, tractive effort, specific energy consumption, factors affecting specific energy consumption, acceleration and braking retardation, adhesive weight and coefficient of adhesion.

UNIT-IV

Electric Drives-Individual and collective drives- electrical braking, plugging, rheostatic and regenerative braking load equalization use of fly wheel criteria for selection of motors for various industrial drives, calculation of electrical loads for refrigeration and air-conditioning, intermittent loading and temperature rise curve.

UNIT-V

Introduction to Electric and Hybrid Vehicles Configuration and performance of electrical vehicles, traction motor haracteristics, tractive effort, transmission requirement, vehicle performance and energy consumption.

Text Books

1. Garg, G.C., Utilization of Elect. Power and Elect. Traction, Khanna Publishers.
2. N V Suryanarayan, Utilization of Elect. Power including Electric Drives and Elect. Traction, New Age International.
3. Mehrdad, Ehsani, YiminGao, Sabastien.E. Gay, Ali Emadi, Modern electric, hybrid electric and fuel cell vehicles, CRC Press.

Reference Books

1. Open Shaw, Taylor, .Utilization of electrical energy, Orient Longmans.
2. H. Pratap, Art and Science of Utilization of Electrical Energy, Dhanpat Rai & Co.
3. Gupta, J.B., Utilization of Elect. Energy, Katariya and sons, New Delhi.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EE3EL10	VLSI	3	0	0	3

UNIT-I

VLSI concepts in terms circuit designer perspective: Introduction, general overview of design hierarchy, layers of abstraction, integration density and Moore's law, VLSI design styles.MOS transistorcharacteristics, MOS switch and CMOS inverter,VTC Parameters (DC Characteristics), Bi-CMOS inverter, propagation delay models, switching delay in logic circuits,short-circuit and leakage components ofenergy and power,parasitic capacitance estimation.

UNIT-II

MOSFET fabrication: basic steps of fabrication, CMOS p-well and n-well processes, twin tub process,layout design rules, layout of an inverter, Bi-CMOS fabrication process; latch-up in CMOS inverter and itsprevention.Interconnects: resistance, capacitance, delays, performance optimization of digital circuits by logicaleffort sizing.

UNIT-III

Combinational logic design: static CMOS construction, ratioed logic, pass transistor, transmissiongate logic, DCVSL, dynamic logic design considerations, noise considerations in dynamic design powerdissipation in CMOS logic, domino and NP domino logic, sequential circuits: classification, parameters, static latches and register, race condition, dynamiclatches and registers, two phase vs. single phase clock designs.

UNIT-IV

Subsystem design: Design of arithmetic building blocks like adders, multipliers, area-speed-powertradeoff. Single stage amplifiers: basic concept, common source stage, source follower (common-drain)and common gate with various loads.

UNIT-V

Semiconductor memories: SRAM, DRAM, non-volatile memories; differential sense amplifiers, singleended sense amplifier;testability of VLSI: fault models, scan-based techniques, BIST, test vector generation, IDDQ.

Text Books

1. N. Weste and D. Harris, CMOS VLSI Design: A Circuits and Systems Perspective, 3/e,Pearson Education India.
2. J.M. Rabaey, A. Chandrakasan and B. Nikolic, Digital Integrated Circuits- A Design Perspective, Prentice Hall of India.
3. N. Weste and EshraghianPrinciplesof CMOS VLSI Design: A Systems Perspective, 2/e,Pearson Education Asia.

Reference Books

1. D. A. Hodges, H. G. Jackson, R. Saleh, Analysis and Design of Digital Integrated Circuits inDeep submicron Technology, 3/e, McGraw Hill.
2. Kang and Leblevici, CMOS Digital Integrated Circuits Analysis and Design, 3/e, McGraw Hill.
3. J. P. Uyemura, Introduction to VLSI Circuits and Systems, John Wiley & Sons (Asia).

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EE3EL03	Digital Signal Processing	3	0	0	3

UNIT- I

Introduction to digital signal processing: Discrete time signals & systems, linear shift invariant systems, stability and causality, linear-constant coefficient difference equations, frequency domain representation of discrete time signals and systems, properties of the discrete time fourier transform (DTFT), sampling and discrete time processing of continuous-time signals.

UNIT- II

Z-transforms- Applications of z-transforms, solution of difference equations of digital filters, system function, stability criterion, frequency response of stable systems, one sided Z-transform and its applications.

UNIT-III

Frequency analysis of signals and systems: Frequency analysis of continuous time signals, frequency analysis of discrete time signals, properties of fourier transform for discrete time signals, frequency domain characteristics of linear time invariant systems, linear invariant systems as frequency selective filters, inverse systems and de-convolution.

UNIT- IV

Discrete Fourier series: Properties of discrete Fourier series, DFS representation of periodic sequences. Discrete fourier transforms, properties of DFT, fast fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms. Inverse FFT.

UNIT-V

Design of Digital Filters: General considerations, design of finite impulse response (FIR) filters, design of infinite impulse response (IIR) filters from analog filters, frequency transformations, design of digital filters based on least-square method and window method, comparison of IIR and FIR filters.

Text-Books

1. Oppenheim & Schaffer, Digital Signal Processing, PHI.
2. J Cavacchi Digital Signal Processing Wiley India.
3. S. Salivahanan, "Digital Signal Processing", McGraw Hill Education (India) Private Limited

Reference Books

1 Ludeman Fundamental of Digital Signal Processing, wiley india.
2 Antoniou, Digital Filters Analysis & Design, TMH.
3 Anand Kumar Digital Signal Processing ,PHI

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EE3EE01	Solar Energy system	3	0	0	3

UNIT- I

World Energy Sources: Energy, economy and social development, classification of energy sources, causes of energy scarcity, importance of RES, energy chain, environmental aspects of energy, World energy status, and Indian energy scenario. Sustainable Sun's energy, conversion challenges and advantages.

UNIT- II

Solar radiation on the earth surface: extraterrestrial radiation characteristics, terrestrial radiation, solar isolation, spectral energy distribution of solar radiation. Depletion of solar radiation- absorption, scattering. Measurement of solar radiation- pyranometer, pyrheliometer, sunshine recorder. Solar time local apparenttime (LAT), equation of time (E).

UNIT -III

Solar radiation geometry: Earth sun angles, solar angles, calculation of angle of incidence, surface facing due south, horizontal, inclined surface and vertical surface, sun path diagram, shadow determination, estimation of sunshine hours at different places in India. Calculation of total solar radiation on horizontal and inclined surfaces, prediction of solar radiation availability.

UNIT-IV

Solar thermal conversion: basics, solar collectors, classification,flat plate type- liquid and air type, concentrating type- compound parabolic, cylindrical parabolic, parabolic dish, hemispherical bowl mirror and central tower receiver. Solar water heaters, solar dryers, solar cooling and refrigeration thermal storage, solar industrial heating system, solar cookers, solar green house, solar thermal power generation- thermal water pump, solar vapour compression refrigeration and central tower receiver power plant.

UNIT -V

Solar photovoltaic energy conversion: principles, physics and operation of solar cells. classification of solar PV systems, solar cell energy conversion efficiency, I-V characteristics, effect of variation of solar insolation and temperature, losses. Solar PV system. Design of irrigation system, street lighting system and rooftop mounted system

.

Text Books

1 B. H. Khan, Non conventional energy sources, Mcgraw hill.

2 C. S. Solanki, Solar Photovoltaics - Fundamentals, Technologies and Applications, Prentice Hall India Learning Private Limited.

3 G. N. Tiwari, Solar Energy: Fundamentals, Design, Modelling and Application, Narosa Publishing House Pvt. Ltd.

Reference Books

1 Foster R., Ghassemi M., Cota A., "Solar Energy", CRC Press.

2 Garg H.P., Prakash J., "Solar Energy Fundamentals and Applications", Tata McGraw-Hill.

3 Petela, R., "Engineering Thermodynamics of Thermal Radiation for Solar Power", McGraw-Hill Co.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EE3EL11	Power Electronics Application to RES	3	0	0	3

UNIT-I

Introduction- Environmental aspects of electric energy conversion: impacts of renewable energy generation on environment, renewable energy resources: solar, wind, ocean, biomass, tidal energy, hydrogen energy systems, fuel cells operating area operating principles and characteristics. Significance of renewable energy.

UNIT-II

Electrical machines for renewable energy conversion- Review of reference theory fundamentals-principle of operation and analysis: IG, PMSG, SCIG and DFIG.

UNIT-III

Power converters- Review of power electronics converters: DC-DC converters, AC-DC converters, AC-AC converters, DC-AC converters, PWM converters.

Solar system: Block diagram of solar photovoltaic system, buck, boost and buck-boost converters, selection of inverter, battery sizing, array sizing. Case study for rooftop PV system, street light system, irrigation system.

Wind System: Block diagram of wind energy system, sizing of converters, Case study for stand-alone system.

UNIT-IV

Grid Connected Wind & Solar Energy Systems

Grid connectors, connection issues, wind farm and its accessories, grid related problems, generator control, performance improvements, different schemes, power converters for grid connected wind energy conversion system and grid connected solar energy converter systems, hybrid systems, types of cogeneration processes.

UNIT- V

Hybrid renewable energy systems- Need for hybrid systems, range and type of hybrid systems, case studies of wind-PV, PV-Battery, PV-wind-battery system.

Text Books

1. S.N. Bhadra, D. Kastha, & S. Banerjee "Wind Electricaal Systems", Oxford University Press.
2. Rashid .M. H "power electronics Hand book", Academic press.
3. Rai. G.D, "Non conventional energy sources", Khannapublishes.

References Books

1. Rai. G.D," Solar energy utilization", Khanna publishes.
2. Gray, L. Johnson, "Wind energy system", prentice hall linc.
3. Non-conventional Energy sources B.H.Khan Tata McGraw-hill Publishing Company.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EE3ES03	Electrical Distribution Systems	3	0	0	3

UNIT– I

General Concepts- Introduction to distribution systems, Load modeling and characteristics. Classification of loads (Residential, commercial, Agricultural and Industrial) and their characteristics.

Power quality & electricity load forecasting- power loads, connected load, load forecasting: long term load forecasting, short term load forecasting, meaning of power quality, affecting parameters, sources of problems and remedies.

UNIT– II

Planning criteria and standards- Design Considerations of Distribution Feeders: Radial and loop types of primary feeders, voltage levels, feeder loading: consequence of under loading and over loading, basic design practice of the secondary distribution system. Distributed generation, model distribution system.

UNIT– III

Substation location and optimal rating- Location of Substations: Rating of distribution substation, feeder wise analysis of consumer end voltage. Benefits derived through optimal location of substations. Capacity wise load monitoring of transformers/ HT, LT feeder. Voltage drop calculations & technical justification to ensure rated voltage profile. Distribution system economics.

UNIT– IV

Compensation for Power Factor Improvement& Power loss calculation : Capacitive compensation for power–factor control, Different types of power capacitors, shunt and series capacitors, Power factor correction, Capacitor allocation,consumer services. Analysis of power loss and appropriate actions for reduction of technical & commercial losses.

UNIT – V

Metering, billing and collection- metering, meter, solid state meter, advanced meter infrastructure system (AMI), meter selection, antitheft meter, high voltage metering, reactive power metering, meter installation, periodic testing of meter, billing, collection. Introduction to distribution automation.

Text Book

1. "Electric Power Distribution system, Engineering" – by TuranGonen, McGraw–hill Book Company.
2. Electrical Power Distribution and Automation by S.Sivanagaraju, V. Sankar, Dhanpat Rai & Co.
3. Electrical Power Distribution Systems by V.Kamaraju, Right Publishers.

Reference Books

1. Electrical Distribution Systems by Dale R.Patrick and Stephen W.Fardo, CRC press
2. Electric Power Distribution – by A.S. Pabla, Tata McGraw-hill Publishing company, 4th edition.